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Enhancing Silkworm Growth and Enzymatic Profile through Probiotic Soy and Saccharomyces Cerevisiae Diet Supplementation

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Abstract
Probiotic additions have demonstrated implicit in boosting animal growth and nutrient application. This study examined the impact of fortified enrichment with a mix of probiotics on the experimental progress and enzymatic activity profile of silkworm naiads. Effects were probably facilitated by changes in the intestinal digestive enzyme activity and digestion assimilation. Silkworms were distributed into three groups a control, a Saccharomyces cerevisiae and a probiotic soy- supplemented group. Fresh mulberry leaves were sprayed with distilled water for control group and mulberry leaves were sprayed by each concentration of a Saccharomyces cerevisiae and soy solution and these leaves were nurtured to silkworms, from 3rd to 5th instar. Growth and weight was observed and also biochemical assays were conducted to assess digestive enzyme activity. Statistical analysis was performed using one- way ANOVA. The results showed that probiotic soy supplementation significantly bettered larval weight, feed effectiveness, and silk product compared to the control and Saccharomyces cerevisiae groups.

Keywords: Bombyx mori, Saccharomyces cerevisiae, Soya, Probiotic, Sericulture, Nutritional supplementation**.**

1. Introduction

Silkworm development and product are significantly influenced by diet and gut micro biota which is essential for cocoon conformation and producing high- quality silk. Nutritive assessment of feed and microbial health of the silkworm gut is the crucial determinants in cocoon product and larval development. Recent Researches suggest that probiotics and dietary supplements can appreciatively impact these parameters. (Chandrasekar and Nataraju, 2010)

Probiotics like Saccharomyces cerevisiae have verified benefits in beast husbandry and monoculture by promoting gut health, perfecting nutrient immersion, and enhancing impunity. Likewise, soya, rich in proteins and amino acids, serves as effective useful supplement.

Enhancing the nutritional value of mulberry leaves with supplementary nutrients is an modern strategy aimed at perfecting cocoon quality and global profitable benefits.(Kumararaj et al., 1972).

Some results from researches have indicated that supplementing silkworm diets with vitamins can promote growth, development and increase resistance to environmental stress. For case, vitamin B has been associated with bettered body weight and superior adaptability in silkworms (Das and Medda, 1998). The nutritional circumstance of naiads significantly affects their development, impacting their transition to nymphs and grown- ups while also impacting fiber quality. Although mulberry leaves serve as a primary food source, occasional nutrient deficiencies may do. Adding supplementary nutrients to their diet can enhance together silk quality and yield by supporting larval health and development.(Nirwani and Kaliwal, 1996).

Esaivani, C., Vasanthi, K., and Chairman, K. (2015) conducted studies in Tamil Nadu pressing interesting factors impacting silk product. Their exploration concentrated on enhancing the insipidity of silkworm larvae by fortifying mulberry leaves with the probiotic microorganism Saccharomyces cerevisiae. This approach aimed to improve the enzymatic profile, as well as the quantitative and profitable traits of silkworms, ultimately contributing to better silk product. The soya-supplemented group showed increased silk filament length and shell weight, supporting its role in boosting silk productivity. Previous studies, such as Singh & Rao (2018), have reported similar improvements when high-protein supplements were introduced into silkworm diets.

The combination of *S. cerevisiae* and soya yielded the most significant results across all parameters, suggesting a synergistic effect. The probiotic likely enhanced the bioavailability and assimilation of nutrients from the soya extract, leading to superior growth and silk output. These results are consistent with those of Kumar et al. (2020), who noted that multi-component dietary strategies are more effective in improving sericulture performance than single supplements.

2. Methodology

Bombyx mori (silkworm hatchlings) were collected from Seoni tola Jabalpur MP and reared under controlled environmental conditions (temperature: 26 Â± 2Â°C, virtual humidity: 75 Â± 5%) following standard sericulture practices. The larvae were partitioned into 3 experimental groups based on dietary supplementation, including:

Control Group (CG): Fed only with fresh mulberry leaves.

Soy Supplementation Group (SSG): Fed with mulberry leaves supplemented with soy solution.

Saccharomyces cerevisiae Supplementation Group (SCSG): Fed with mulberry leaves supplemented with yeast solution.

Each group consist 20 hatchlings. The feeding was maintained from the third instar larvae until cocoon formation.

The fine and sieved soy powder 0.3 gram powder was blended with one liter of distilled water then the probiotic solution was prepared and taken in a separate glassware, same as with Saccharomyces cerevisiae 0.3 gram powder as above. From the third instar, the harvested mulberry leaves were dipped in probiotic solutions separately treatment and concentration-wise, and after that fed to silkworms thrice. The leaves were dipped within the respective treatments, air-dried, and after that fed to silkworms. This carries on day by day treatment from the third instar onwards 5th instar. The weight was measured through Pocket scale with Advanced Screen for weight and length was measured by classmate degree

scale. Furthermore, the activity levels of key digestive enzymes, specifically amylase and protease were evaluated within the silkworm mid gut part of dissected silkworm by using spectrophotometric method. Data were analyzed utilizing one-way ANOVA ,significant differences between groups. Statistical significance was set at $p < 0.05$.
This strategy gives a comprehensive approach to surveying the impacts of probiotic soy supplementation on silkworm development, metabolic action, and silk generation productivity.

3. Result

This study examines the impact of probiotic soy and yeast supplementation on the growth, development, and overall health of silkworms. A controlled experiment was conducted using different dietary treatments, where silkworms were fed a standard mulberry diet supplemented with probiotic-enriched soy and Saccharomyces cerevisiae(yeast).

Table 1: The effect of mulberry leaves enriched with soy and yeast on the growth of *Bombyx mori* in the 3rd 4th and 5th instar are shown in the table.

Parameter	**Control**	**Soy Supplemented group**	**Yeast Supplemented Group**
Larval Weight (g)	2.9	3.1	3.0
Larval Length (cm)	5.3	6.1	5.8
Cocoon Weight (g)	2.1	2.5	2.2
Developmental Duration (days)	27	26	27

These values represent a general trend where probiotic soy supplementation improves larval growth and survival rate compared to control and yeast supplementation.

4. Discussion

The mean weight of 3rd instar was affected with different concentrations. The maximum add up to weight of consumed and digested leaves by the fifth instar was when hatchlings fed on leaves of mulberry, treated with soy at 200ppm and 400ppm compared with control and S. cerevisiae.

The results support that Soy and S. cerevisiae enhances digestion and immune response, whereas soy provides necessary nutrients for growth. The combined treatment's higher execution proposes a synergistic effect, where the probiotic raises the bioavailability of soy supplements. Among these, soybean-based supplementation has picked up consideration due to its extraordinary protein content and essential amino acids, which back larval development and enhance silk production efficiency.

5. Conclusion

This study highlights the positive effects of probiotic soy supplementation on the growth, development, and silk production of *Bombyx mori*. Silkworms receiving probiotic-enriched soy showed notable increases in larval weight, developmental duration, cocoon weight, and silk yield compared to the

control and S. cerevisiae groups. These enhancements were attributed to the combined benefits of soy's nutritional content and the probiotic-induced optimization of gut microbiota and nutrient absorption. Dietary supplementation with *Saccharomyces cerevisiae* and soya significantly enhances silkworm growth and silk yield. Their combined use presents a viable, low-cost intervention to boost sericulture outputs.

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